

HELP Guiding Principles for Incorporating Environmental Justice into Flood Risk Management



Cover photo: Flood cleanup at in barangay Tumaga in Zamboanga, Philippines, Nov. 20, 2022; Source: U.S. Marine Corps photo by Sgt. Liliana Navarro

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This report was prepared through a joint collaborative action by international experts on the responsibility of the High-level Experts and Leaders Panel on Water and Disasters (HELP). This action was led by the U.S. Army Corps of Engineers (USACE) and coordinated by the USACE Institute for Water Resources and Deltares. The views and opinions expressed in the document are those of the authors and contributing experts and do not necessarily reflect the official views, opinions, policies or positions of HELP or any other hosting government or organization.

About HELP

The High-level Experts and Leaders Panel on Water and Disasters was convened at the request of the UN Secretary General's Advisory Board on Water and Sanitation in 2007. The ambition of HELP is to assist the international community, governments and stakeholders in mobilizing political will and resources. HELP will promote actions to raise awareness, ensure coordination and collaboration, establish common goals and targets, monitor progress, and take effective measures aimed at addressing the issues of water and disasters. Contact HELP secretariat for more information on the HELP activities (helpsecretariat@wateranddisaster.org).

Please cite the work as follows: Logan, William S. and Kathryn L. Roscoe. 2023. HELP Guiding Principles for Incorporating Environmental Justice into Flood Risk Management. HELP report.



At a Glance

Advances in flood risk management (FRM) have done much to lower deaths and property losses, but we can do more to ensure that disadvantaged communities share fully in this success.

In this report we highlight approaches that can broadly and equitably engage stakeholders—regardless of race, color, national or ethnic origin, disability, gender identity or sexual orientation, or income—in all phases of the flood risk management process. This includes water resources planning and flood mitigation, preparedness, response, and recovery.

The principles and “best practices” in this report, each of which is illustrated by a case study, are organized into four general categories: a) Ensuring equitable benefits for disadvantaged communities, b) Diversifying representation in FRM, c) Improving outreach and inclusion in FRM, and d) Advancing knowledge and education. They emphasize policy and law, high-level leadership, relationship-building, effective two-way communication and awareness of the human element. Each watershed or basin—and the political and cultural landscape in which it exists—is unique. The principles and best practices described here can be useful in a wide variety of projects and geographies, but this report is not intended to be prescriptive.

Strengthening flood resilience among disadvantaged communities involves integrating FRM with broader community development and revitalization efforts. Thus, efforts to incorporate environmental justice into FRM can be leveraged beyond water resources management and disaster planning towards a better integration of vulnerable communities into our broader social and economic systems.




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Why this Report?

Advances in flood risk management have saved lives and livelihoods; this report describes fifteen “best practices” to help ensure that disadvantaged communities share fully in this success.

According to the 2021 WMO Atlas of Mortality and Economic Losses from Weather, Climate and Water Extremes (1970 – 2019), 44% of disasters globally have been associated with floods. Two of the top 10 disaster events during those 50 years, ranked by number of deaths, were flood related, resulting in about 58,700 deaths in these two events alone. And flood threats are projected to worsen. The Intergovernmental Panel on Climate Change’s Sixth Assessment Report states that, at 1.5°C global warming, “heavy precipitation and associated flooding are projected to intensify and be more frequent in most regions in Africa and Asia (high confidence), North America (medium to high confidence) and Europe (medium confidence).” Thus, the future may bring additional flood challenges in terms of both number and intensity of flood events.

To reduce flood hazards and impacts, governments and development banks engage in flood risk management (FRM), that is, the reduction of flood risk and management of residual risks associated with flooding. FRM includes “hard” infrastructure such as dams, levees, and floodwalls, as well as “softer” alternatives such as green infrastructure, land acquisition, flood insurance, and evacuation planning. While these measures have proved to be effective,

the benefits have often not been shared equitably. Poor, minority, indigenous and other disadvantaged communities are often left out of infrastructure planning and management efforts, as well as during the disaster response and rebuilding phases. Issues can include lack of high-level policy direction, failure to use existing tools to identify disadvantaged communities, poor communication by planners, mistrust of government agencies, difficulty in attending planning and preparedness meetings, and use of benefit-cost criteria that disfavor poor communities.

In the spirit of the UN Sendai Framework for Disaster Risk Reduction 2015 - 2030, this report highlights approaches that engage disadvantaged communities in all phases of the FRM process—from water resources planning to flood mitigation, preparedness, response, and recovery. Additionally, an overall picture is provided regarding how water resources engineers, planners, managers, and decision makers—from the working level to the policy level—can extend their efforts to assist communities in need without jeopardizing their other commitments to reducing loss of life and property. Guidance in this report is accomplished through recommended best practices and globally distributed case studies to illustrate both knowledge and practice.

Chapter 1:

Flood Risk Management and Environmental Justice

This report focuses on Guiding Principles for Incorporating Environmental Justice into Flood Risk Management. To this end, we must first define environmental justice and flood risk management and identify where they intersect.

What is Environmental Justice?

Environmental justice in this report is defined as:

“The fair treatment and meaningful involvement of all people, regardless of race, color, national or ethnic origin, disability, gender identity or sexual orientation, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” Achievement of this goal will occur “when everyone enjoys the same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work” (EPA 2022). Our definition of the term “environment” in this report includes human as well as natural habitats. Note that in this report we are as concerned with the access of vulnerable populations to the decision-making process as with the effectiveness of a given environmental law or policy.

The term “environmental justice” covers a broad range of topics, including air pollution, industrial contamination of soils and water, pesticide impacts on farm workers, inadequate housing and transportation, and many other issues. However, this report focuses primarily on environmental justice topics related to flood risk management.

What is Flood Risk Management?

The definition of flood risk management (FRM) used in this brief is:

“The process of data and information gathering, risk analysis and evaluation, appraisal of options, and making, implementing and reviewing decisions to reduce, control, accept or redistribute flood risks. It is a continuous process of analysis, adjustment and adaptation of policies and actions taken to reduce flood risk (including modifying the probability of flooding and its severity as well as the vulnerability and resilience of the receptors threatened). FRM is based on the recognition that risks cannot be removed entirely, but only partially, and often at the expense of other societal goals.” (Sayers et al. 2013)

Though not explicitly mentioned in this definition, flood disaster response and recovery can both be seen as part of the “continuous process of analysis, adjustment and adaptation”.

FRM includes the use and resiliency of structures such as dams, levees and floodwalls, as well as promoting alternatives, such as land acquisition, flood proofing, insurance, etc., to reduce the risk of loss of life, reduce long-term economic damages, and improve the natural environment.



Where do Environmental Justice and Flood Risk Management intersect?

Environmental justice intersects with flood risk management in all stages of the FRM life-cycle described above. Examples of this intersection are described in the figure below.

Each of these intersections is discussed in the following chapters.

The definition of environmental justice used in this report is painted with a broad brush, and there are complex nuances

that must be addressed by each country individually. Issues such as who pays for protection, who is liable for damages, who can speak on behalf of various stakeholder groups, and the rights and responsibilities of the uninsured are important considerations (Thaler and Hartmann 2016), but beyond the scope of this report. Likewise, the cumulative impacts of many kinds of environmental stressors, including soil and groundwater contamination, air pollution and water-related disease, are important to consider in addition to issues treated here.

FRM life-cycle stage 	Example of intersection with environmental justice 
Data and information gathering	Economic, demographic or cultural data may be used to understand where disadvantaged populations are located
Risk analysis and evaluation	Communication with disadvantaged communities helps to better understand their vulnerabilities and impacts
Appraisal of options	Considering alternative (more equitable) benefit indicators when prioritizing and evaluating options
Decision-making on reducing or redistributing flood risk	The passing of laws and policies that may make it easier to adopt options beyond those with the highest cost-benefit ratios.

Examples of the intersection between environmental justice and the stages of the FRM life-cycle. Created by Kathryn Roscoe.

Chapter 2:

Overview of Past and Current Practice

Flood Risk Management (FRM) is implemented by a broad range of entities. These include national water resources, hydropower, agricultural, natural resource management, and planning agencies; multilateral development banks, such as the World Bank, Asian Development Bank, the African Development Bank, Inter-American Development Bank, and the European Bank for Reconstruction and Development; and other institutions such as the Millennium Challenge Corporation and the China Development Bank. Local and regional agencies and institutions typically share in the planning, construction, and management of infrastructure and may play an important role in developing and enforcing the relevant environmental and health regulations.

It is often difficult to know where we are going if we do not first examine where we've been. Although FRM has been utilized for millennia, this report focuses primarily on FRM practices throughout the last century. Water resources planning and management practices have progressed considerably in recent years, including approaches regarding disadvantaged communities. In this chapter, for context, we show how the environmental justice practices of three major actors in FRM—two development banks and one national water resources agency—have evolved during that time.

The World Bank

The mission of the World Bank is to help low-income populations, but methods



Sailors deliver supplies to tsunami victims, Wakuya, Japan. Source: Kevin Gray, U.S. Navy

to justify investments in flood risk management solutions have traditionally relied on standard benefit-cost analysis using asset damages. Usage of these analyses is largely due to the long-established and accepted methods to carry out these types of analyses. In 2017, the World Bank report “Unbreakable” helped lead to a major change in the bank’s evaluation process for flood risk mitigation investments. The report noted that focusing on aggregate losses for disaster risk restricted the discussion to those wealthy enough to have assets to lose in the first place. However, while the disadvantaged claim only a fraction of economic losses from disasters, they bear the brunt of the consequences.

In response to the findings of the 2017 report, the bank now uses two indicators - financial benefit-cost analysis, and a development perspective that looks at

impacts to the poor. These assessments are often simplistic; because of this, methodological research gaps remain that need to be filled to better operationalize the evaluation of impacts on poor communities. The bank also recently established a resilience rating system, which considers both sustainability of solutions in the future and the contribution of the investment to the resilience of people. The inclusion of these considerations creates an opportunity to incorporate impacts to poorer and more vulnerable sectors of society when building FRM solutions.

Source: Hallegatte et al. (2017).

The Asian Development Bank

The Asian Development Bank (ADB) has been engaged in water projects since its establishment in 1966. Two of the earliest loans of the ADB were to Malaysia to help improve water supplies (1968) and to Indonesia for improved irrigation (1969). From 1970 to the mid-2000s, ADB provided financial support to about 65 projects with dams, for a variety of purposes.

However, these were not without controversy, and in 2000, at the Annual Meeting in Chiang Mai, Thailand, several thousand people gathered to protest what they viewed as threats to their livelihoods from ADB-funded projects, especially dams that had displaced farmers and fisherfolk. Incidents such as these led the bank to introduce an “Accountability Mechanism” in 2003. This had both an informal consultation phase for people to be affected by ADB projects and a compliance review phase to investigate alleged violations of agreements made. This evolution was reflected in the design and construction of the Nam Theun 2 Hydroelectric Project in the Lao People’s Democratic Republic (Box 2.1, p. 6).

Currently, environmental justice issues are primarily addressed through the ADB’s Safeguard Policy Statement (SPS;

2009) and supporting documents. These require an assessment for each proposed project that includes impacts on livelihood and cultural resources of vulnerable groups. It requires meaningful consultation with affected people and facilitates their informed participation prior to construction. And it continues the accountability mechanism noted above, to receive and facilitate resolution of the concerns and grievances affected people.

The SPS also contains “Indigenous Peoples Safeguards” requiring the bank “to design and implement projects in a way that fosters full respect for Indigenous Peoples’ identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits, (ii) do not suffer adverse impacts as a result of projects, and (iii) can participate actively in projects that affect them.”

The SPS is currently being updated.

Sources: McCawley (2017); ADB (2009).



Zandzakken (Sandbags) flood risk management, Netherlands. Source: Deltares Netherlands

BOX 2.1: NAM THEUN 2 HYDROELECTRIC PROJECT IN THE LAO PEOPLE'S DEMOCRATIC REPUBLIC

Achieving social equity in the case of major infrastructure is a challenge even when plans are in place.

The Nam Theun 2 Hydroelectric Project included construction of a dam and 1,070 megawatt (MW) hydropower generation facilities in central Lao PDR. The project was designed to help Lao PDR achieve sustainable growth and poverty reduction. In addition, the project was notable at its inception for having a comprehensive set of social and environmental measures, including several hundred public meetings with communities living near the project and likely to be displaced.

An Asian Development Bank performance evaluation report (2020) concluded that Outcome 3 (Ensure the project's social sustainability) was "substantially achieved". Overall, "incomes of resettled households improved beyond the national rural poverty line and met the project target." However, the national power company may not have been the most appropriate institution

to manage the project's complex social and environmental development programs by itself. The resettlement plans were implemented much in line with the policy, but the ethnic minority development strategy was somewhat "top-down" and "provided inadequate practical guidance on tailoring to meet the needs of different minority groups."

The mixed results show that achieving equity for vulnerable communities can be a complex undertaking, especially for entities that are stronger in engineering than in social and environmental science.

Source: Asian Development Bank (ADB) Independent Evaluation Department (2020). Performance Evaluation Report. Lao People's Democratic Republic: Greater Mekong Subregion—Nam Theun 2 Hydroelectric Project



Reservoir fisheries have developed into a major source of income for most resettled people in the Nakai Plateau. Source: Bart Verweij / World Bank

U.S. Army Corps of Engineers

The Flood Control Act of 1936 (49 Stat. 1470) first authorized the construction of public works on rivers and harbors for flood control by the U.S. Army Corps of Engineers. The act authorized such projects "...if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social

security of people are otherwise adversely affected." This introduced the notion of benefit-cost analysis in FRM but left the beneficiaries of the project unidentified.

The US President's Water Resources Council (1962) discussed the notion that some populations might be disadvantaged relative to others when utilizing a benefit-cost analysis approach. This

called for “reasoned choices” to be made among objectives such as development, environmental preservation, and social well-being when they conflict. Well-being included the hardships experienced by “particular groups” and “development for the benefit of the few or the disadvantage of many” was to be avoided.

The attention given by USACE to social or human well-being—now referred to as “other social effects” (OSE)—fluctuated over the next several decades, but “national economic development” (NED) was either the primary or the sole Federal objective for water resources development. However, Presidential Executive Order 12989 of 1994 required each agency to address “disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.”

USACE Engineering Circular 1105-2-409 (2005) introduced a requirement for broader stakeholder collaboration in water projects. Sadly, the devastation brought by Hurricanes Katrina and Rita only months later underscored that planning efforts to address the needs of socially vulnerable populations were still lacking. Two years later, the Water Resources Development Act of 2007 required USACE to revise its “principles and guidelines” for project evaluation to incorporate “assessment methods that reflect the value of projects for low-income communities [and] “solicit and consider public...comments.”

In 2021, Executive Order 13985 ordered government agencies to “pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality.” In 2022,

internal guidance required USACE Civil Works projects or assistance “to meet the needs of disadvantaged communities by reducing disparate environmental burdens, removing barriers to participation in decision-making, and increasing access to benefits...” These two documents have led to updates to U.S. tribal consultation policies and programs, planning assistance to states, and a formal environmental justice policy. Current USACE environmental justice activities are illustrated in Box 2.2 (p. 8) and in other case studies discussed in Chapter 3.

Sources: Durden and Wegner-Johnson (2013); Baker et al. (2016).

These three institutions have all evolved in the past 60-90 years from a strong focus on benefit-cost analysis, using benefits to a nation writ large or “to whomsoever they may accrue”, to a more nuanced project design and evaluation framework that better accounts for who is paying the costs—financial, but also social, cultural and environmental—and who is receiving the benefits. This evolution is likely paralleled by that of many other national government agencies and regional development institutions.



Municipality Employee cleaning debris from the sewage system in Puerto Rico after Hurricane Maria. Source: Eliud Echevarria, FEMA

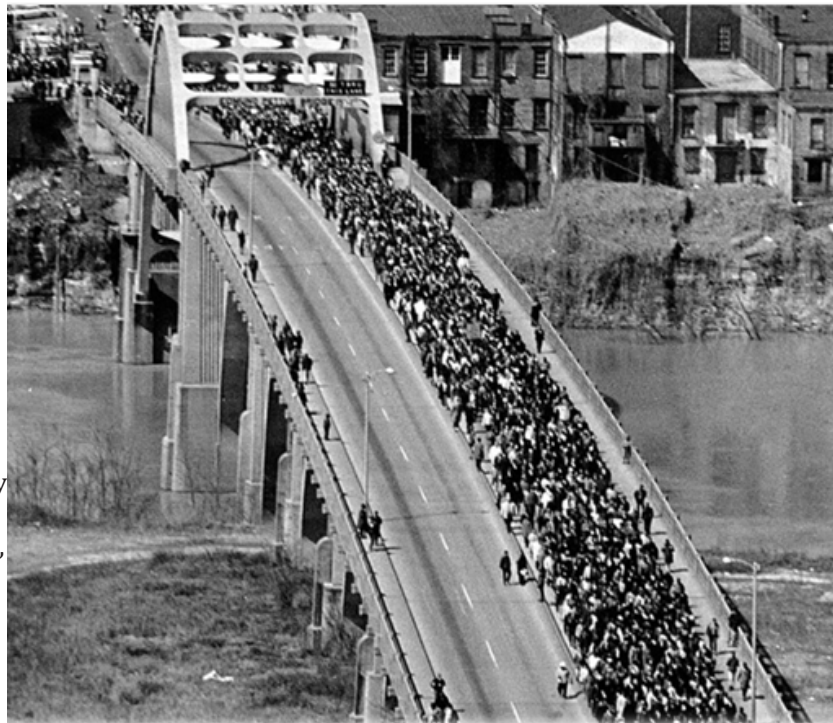
BOX 2.2: EROSION AND FLOOD RISK MANAGEMENT IN SELMA, ALABAMA, USA

Consideration of history, culture and social cohesion in addition to benefit-cost analysis help preserve an iconic city's historic district.

In the aftermath of Hurricane Michael (2018), the U.S. Congress approved a U.S. Army Corps of Engineers (Corps) study to reduce riverbank erosion and flood-related damages for Selma, Alabama, in the Southeastern U.S. Selma played a historically and culturally iconic role in the Civil Rights Movement, notably in 1965, when police violently attacked demonstrators on the Edmund Pettus Bridge as they were attempting to march to the state capital of Montgomery. About 85% of the city's inhabitants are members of racial or ethnic minority groups and 38% are characterized as low-income.

It had been a long-standing goal to address the flood-related erosion and damages to historic structures along the banks of the Alabama River. However, it was clear early in the scoping process that the project would be difficult to justify using standard benefit-cost analysis (BCA). Taking the lessons learned from the aftermath of Hurricane Katrina (2005), the planners engaged many sponsors and community groups to identify issues, facilitate partnership opportunities, and develop equitable solutions to address flooding, while preserving the historic riverfront area around the Bridge.

Planners used the EPA Environmental Justice Screening Tool, census records, historical data and GIS mapping in seeking an exception to the



Civil rights marchers on the Edmund Pettus Bridge. Source: U.S. Army Corps of Engineers and City of Selma, Alabama (2021).

Corps policy requiring recommendation of the plan that maximizes National Economic Benefits, based on consideration of “other social effects”. These effects included the significance of the Old Towne area and the bridge to the nation’s history and culture, and the need for continued social cohesion which could have been damaged by some of the planning options. This exception was granted by Corps leadership in June 2020.

As COVID struck the nation, the team continued holding telephone discussions with sponsors, hosting virtual milestone meetings and public comment meetings via social media live platforms, and conducting news interviews with local news sources. Still, this may have limited the engagement of some vulnerable populations and individuals that could not, or did not, follow those media.

Sources: Jerica Richardson, Stephen Phillips and Alexandria Smith (USACE), written communication.

Chapter 3:

Principles and Best Practices

Each watershed or basin—and the political and cultural landscapes in which it exists—is unique. This chapter is intended to summarize some of the principles and best practices that may be useful to a wide variety of projects and geographies. However, while we use the word “should” throughout the text, it is understood that not all “best practices” are “best” for all places at all times. The practices highlighted here are

illustrated throughout the chapter with case studies, and cover both policy and action, at both national and local levels. We have organized the principles and best practices into four general categories: a) Ensure equitable benefits for disadvantaged communities, b) Diversify representation in flood risk management c) Improve outreach and inclusion in flood risk management, and d) Advance Knowledge and Education.

Ensure equitable benefits for disadvantaged communities	Legislators and decision makers should promulgate laws and policies that assure disadvantaged communities receive an equitable share of benefits from FRM projects.
	Senior national leadership should ensure that these laws and policies receive appropriate attention and an early emphasis at the planning level.
	Decision makers should focus on a comprehensive evaluation of the total, not just economic, benefits of each project or program.
	In the recovery phase of a flood event, policy makers should carefully consider how assistance is distributed.
Diversify representation in flood risk management	Government ministries and agencies should recruit and hire a workforce that is more representative of the full spectrum of the communities that need protection.
	Government institutions should ensure diverse representation on every board and committee that is constituted to advise on FRM-related projects.
Improve outreach and inclusion in flood risk management	Government agencies should develop a strategic plan for engagement and communication with disadvantaged communities.
	Government agencies should initiate outreach and engage disadvantaged communities early in the study process for a new project, and continuously throughout the project.
	Local non-governmental partners should be carefully chosen based on trust by disadvantaged groups for outreach and disaster response.
	Communication messages and materials for disadvantaged communities should be clear and actionable, and tailored to the target audiences.
	Planners should minimize barriers to participation in meetings, such as holding meetings at well-known centers in the community and on evenings and weekends.
Advance knowledge and education	Planners should avail themselves of GIS-based and probabilistic screening tools that can help identify communities at risk and prioritize investments in urban flood resilience.
	Government ministries and agencies involved in designing flood preparedness exercises and early warning systems in regions with traditional or indigenous communities should incorporate traditional knowledge and practices to the extent possible.
	Government agencies should pay special attention to how early warning and other information flows to and from neighborhoods and individuals.
	National agencies, international banks, universities and research institutes, UN agencies, NGOs, and others should coordinate on a shared research agenda to fill in knowledge and methodology gaps.

Ensure equitable benefits for disadvantaged communities

Principle 1

Legislators and decision makers should promulgate laws and policies that assure disadvantaged communities receive an equitable share of benefits from FRM projects.

This may be done through a national water law, as demonstrated in Box 3.1, where flood protection standards in the Netherlands assure a minimum, risk-based level of personal safety for everyone. It may also be by presidential executive orders or agency policy, as referred to in the USACE section in Chapter 2.

BOX 3.1. FLOOD PROTECTION STANDARDS IN THE NETHERLANDS

Individual flood risk requirements and social disruption metrics can be added to cost-benefit analysis to provide more equitable flood protection.



Safety standards in the primary flood defenses in the Netherlands, given as annual failure probabilities. Source: Nationaal Georegister (NGR) Netherlands

The Dutch government carried out an extensive risk analysis to derive flood protection standards for all primary flood defenses in the country (levees, dunes, and hydraulic structures). These flood protection standards are expressed as a maximum allowed annual failure probability.

First, protection standards were derived by adhering to the principle that there must be a basic level of safety for everyone. The basic level of safety is a maximum individual annual probability of mortality, which was set to 1/100,000 per year. This principle ensures that residents in poorer and rural areas of the country receive a more equitable protection level. Once that criterion was met, they further strengthened the standards for areas where the benefit-cost analysis supported this. Lastly, they also applied more stringent standards in areas where there was the potential for catastrophic loss of life or economic damage.

Most et al. (2014), de Bruijn et al. (2014).

Principle 2

Senior national leadership should ensure that these laws and policies receive appropriate attention and an early emphasis at the planning level.

An example of this is in Box 3.2, which translates a presidential executive order to actionable guidance for civil works projects in the U.S.

BOX 3.2. MEMO ON USACE IMPLEMENTATION OF ENVIRONMENTAL JUSTICE

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

“Memorandum for Commanding General,
U.S. Army Corps of Engineers
“15 March 2022

“SUBJECT: Implementation of
Environmental Justice and the Justice40
Initiative

“...Environmental justice and
disproportionate impacts to

disadvantaged communities shall be
considered throughout the [USACE] Civil
Works programs and in all phases of project
planning and decision-making...

“...In studying, planning, designing,
constructing, and operating USACE Civil
Works projects or providing assistance,
USACE shall work to meet the needs of
disadvantaged communities by reducing
disparate environmental burdens, removing
barriers to participation in decision-
making, and increasing access to benefits
provided by Civil Works programs to
disadvantaged communities within USACE
authorities....”



Severe flooding in Lumberton, North Carolina. Source: Staff Sgt. Herschel Talley, Nebraska National Guard

Principle 3

Decision makers should focus on a comprehensive evaluation of the total, not just economic, benefits of each project or program.

Inadequacies in the methodology used for benefit-cost analysis has worked, and

continues to work, to the disadvantage of low-income communities in low-cost housing (Chapters 1 and 2). In contrast, placing more emphasis on welfare loss than on asset loss is more favorable to poor communities, as is shown in Box 3.3 for coastal Bangladesh.

BOX 3.3. PRIORITIZING WELFARE LOSS IN FLOOD RISK ASSESSMENT IN COASTAL BANGLADESH

A focus on asset loss may lead to programs that preferentially assist wealthy communities; a focus on welfare loss may lead to more help for poor communities.

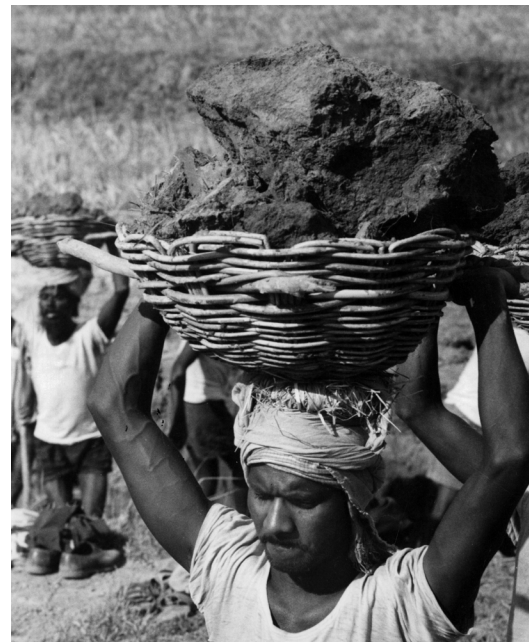
Flood risk assessments tend to focus on asset losses. Higher-income residents tend to have the greatest asset losses due to their correspondingly higher property values. However, they also tend to have greater resources to smooth out income shocks and rebuild their financial and social lives. Poor households, on the other hand, typically lack major assets, but may experience long-term impacts to their household welfare due to income, savings and consumption losses, thus pushing them further into poverty.

A study in the Western and Central Bangladesh Coastal Zone, for example, found that poor households experienced an average of only 7% of the asset losses, but suffered about 42% of the welfare losses. Defining resilience, somewhat simplistically, as the ratio of asset loss to welfare loss, a wealthy landowner (high asset loss) with property insurance (low welfare loss) would be more resilient than a poor, uninsured renter. Regionally, poor households were estimated to have, on average, 13 times lower resilience than non-poor households, ranging from ~7 to ~37 times, depending on the district.

New methods are being developed to estimate welfare losses and resilience and incorporate them into flood risk assessments and, later, government-based rebuilding

efforts. Such methodologies, if followed, could help to identify flood mitigation, preparedness, response and recovery options that enhance resilience and provide proportionally more benefits to the most vulnerable residents of a river basin or coastal zone.

Source: Verschuur et al. (2020).



A Bengali laborer totes a load of earth on a river bank project, Bangladesh. Source: USAID, Historical Archive

Principle 4

In the recovery phase of a flood event, policy makers should carefully consider how assistance is distributed.

Rules associated with assistance and “buy-out” programs are complex and may favor property owners and those who can document those losses, rather than those most affected in terms of employment, transportation, educational opportunities and other welfare-related losses. Box 3.4

shows that disaster recovery programs can exacerbate rather than ameliorate wealth inequality in a region. Further, as important as financial assistance is following a major flood event, maintaining community and social structure is crucial as well. Following a catastrophic tsunami in northeastern Japan, grassroots, community-based planning helped assure continuity in social networks even though major relocations were necessary (Box 3.5, p. 14).

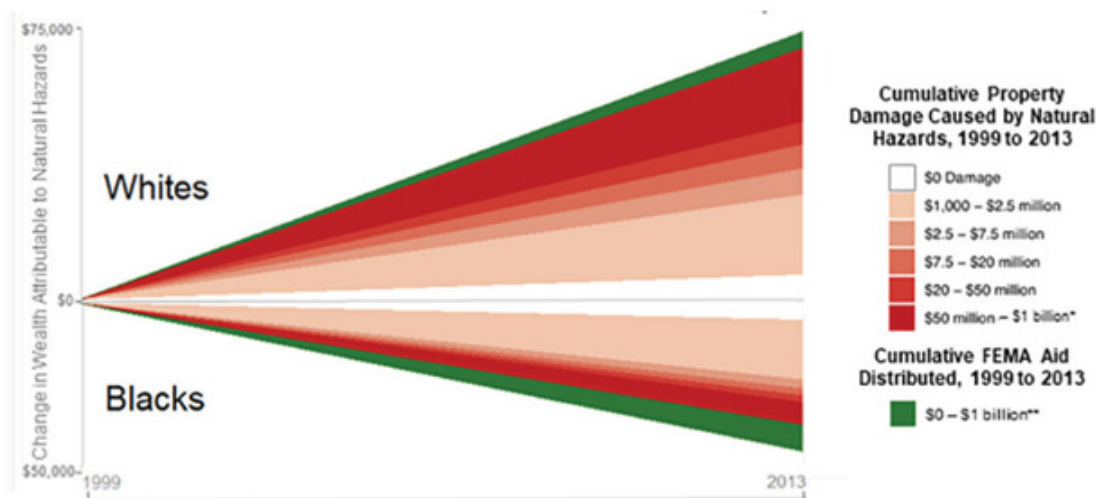
BOX 3.4: IMPACTS OF DISASTERS ON WEALTH INEQUALITY

In the United States, as local hazard damages increase, so does wealth inequality.

It seems intuitive that, after a major flood, wealth of most of those affected would decrease due to property damage and other losses. However, research is showing that as local hazard damages increase, so does wealth inequality, especially along lines of race, education, and homeownership. Additionally, at any given level of local damage, the more aid an area receives from the Federal Emergency Management Agency, the more this inequality grows. These findings suggest that wealth inequality and rising natural hazard damages are linked in some way.

Possible factors include a) federal policies that emphasize restoring property, especially that of homeowners, rather than human welfare, b) federal policies designed to minimize fraud that require extensive documentation of losses, and c) how properties are valued in the first place.

It is not known whether analogous situations exist in other countries, but it seems that programs designed to assist in recovery from floods and other disasters should be examined for potential inequity.



Cumulative property damage from natural hazards and its effects on racial wealth gaps in the United States, 1999-2013. The map displays the cumulative property damage caused by natural hazards in each county from 1999 to 2013. Source of text and figure (slightly adapted): Howell and Elliot (2018).

BOX 3.5: LARGE-SCALE MANAGED RETREAT AND STRUCTURAL PROTECTION FOLLOWING THE 2011 TSUNAMI IN JAPAN

The elderly can be provided with special services after a flooding event that preserves their traditional community structures and networks.

On March 11, 2011, a tsunami killed almost 16,000 people, with several thousand more missing, and destroyed more than 130,000 homes along the northeastern coast of Honshu, Japan. Much of the region is rural, and with declining populations during recent decades, the demographics are skewed toward the elderly. Many small villages in the region were declared off-limits to residential use in perpetuity, but elderly populations have special needs regarding post-tsunami relocation initiatives. These include social structures in addition to financial assistance.

The relocation response took such social needs into account, through community-based planning. For example, a drop-in center was established in Ofunato city (Iwate Prefecture) to serve senior citizens displaced by the tsunami. Rather than building a modern urban structure, a traditional farmhouse was moved to the site and renovated by elderly local residents. The primary goal of the center, or “house”, was to help merge relocated senior citizen tsunami refugees into an existing community through self-organizing community activities.

Further south in Iwate Prefecture, in Ishinomaki city, many low-lying areas had been occupied by small fishing villages. A grassroots planning committee was created to engage local stakeholders, especially local women’s groups, in the design of relocation



A local resident gazes at his home that was turned onto its side by a tsunami, Oshima, Miyagi, Japan. Source: Cpl. Megan Angel III Marine Expeditionary Force

projects. With technical assistance, the committee planned eight new communities on higher ground but essentially as one-for-one replacements, allowing survivors from the original villages to remain together. The new community sites are located within several km of the original villages to assist with the maintenance of social networks, and in one town, social committee members were designated to check twice daily on particularly vulnerable individuals.

This approach has helped keep communities and their elderly population intact to the extent possible. Efforts were made to preserve social bonds while encouraging new caring relationships during the years many survivors were in temporary housing. New settlements were designed to help maintain community integrity through careful design with major input from the displaced population. Lastly, legal arrangements were made to ensure that families maintained legal access to dock their boats and fish in their traditional locations which were within 10 miles of their new homes. This respected tradition as well as ensuring they had a source of income.

Source: Pinter et al. (2019).

Diversify representation in flood risk management

Principle 5

Government ministries and agencies should recruit and hire a workforce that is more representative of the full spectrum of the communities that need protection.

Communications with disadvantaged communities will be facilitated by a workforce that includes members from that community. This should be obvious on its face, but national institutions often lack full representation from local indigenous groups, minority populations, the disabled and others. An example

of legislation to incorporate cultural competence for emergency planning in California, USA is given in Box 3.6.

Principle 6

Government institutions should ensure diverse representation on every board and committee that is constituted to advise on FRM-related projects.

The experience of the first county in California to incorporate cultural competence into their emergency operations plan is also described in Box 3.6.

BOX 3.6: INCORPORATING CULTURAL COMPETENCE IN EMERGENCY PLANNING

Government agencies, which often draw their professional staff from major universities that may themselves have few students and faculty from underserved communities, often have little cultural competency to deal with linguistic, cultural, and other minority communities, or the disabled. The State of California is leading other US states in addressing this issue.

California Senate Bill 160 (2019) directs counties to incorporate cultural competence into their emergency plans, including communications, evacuation and sheltering, mitigation and prevention, planning and preparedness. It defines “culturally diverse communities” broadly, to include “indigenous peoples, communities of color, and immigrant and refugee communities; ... women; ... the elderly and youth; sexual and gender

minorities; people with disabilities; ... low-income individuals and the unhoused; [and] people with no or limited English language proficiency.

Sonoma County was the first county in California to incorporate cultural competence into their Emergency Operations Plan. The county established a community advisory group to provide input into the development of their plan, which was co-coordinated by the county Department of Emergency Management and the Office of Equity and included a collaborative of Latino and immigrant organizations. Through the plan development process, 137 recommendations raised by the community advisory group and community members were considered and dozens were incorporated into the plan.

Improve outreach and inclusion in flood risk management

Principle 7

Government agencies should develop a strategic plan for engagement and communication with disadvantaged communities.

Such a plan should include early engagement to understand how flooding is impacting disadvantaged communities and identify solutions that can help address the impacts. The plan should also establish methods and metrics for assessing equity impacts of FRM solutions, with regular meetings to assess progress and execution. Early engagement (prior to onset of a project) is essential because establishing trusting relationships with disadvantaged communities can take years or decades.

Principle 8

Government agencies should initiate outreach and engage disadvantaged communities early in the study process for a new project, and continuously throughout the project.

Early and continuous engagement is important to address problems and concerns as they arise. An example of this was the development of a Community-Based Flood Early Warning System in Durban, South Africa (Box 3.7, p. 17). Built from the bottom up with local input, the system helped a highly vulnerable informal settlement avoid any loss of life while 459 others lost theirs elsewhere in the city.

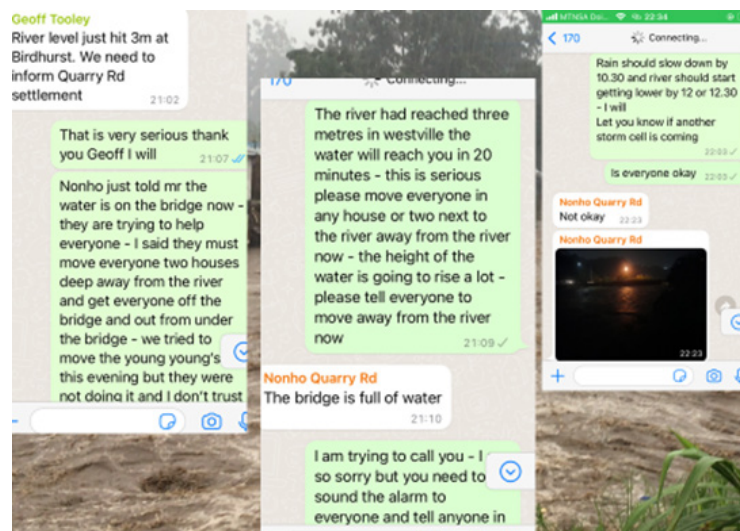


The impact of the April 2022 flood on Quarry Road West informal settlement, South Africa. Source: Photo © Catherine Sutherland, University of Kwa-Zulu Natal

BOX 3.7: COMMUNITY-BASED FLOOD EARLY WARNING SYSTEM (CBFEWS) IN THE PALMIET CATCHMENT, DURBAN, SOUTH AFRICA

An effective, community-based flood early warning system can save hundreds of lives in informal settlements.

On 11-12 April 2022, 30% of Durban, South Africa's average annual rainfall fell in 24 hours, causing extensive infrastructure and property damage and resulting in the loss of 459 lives. The number of lives lost would have been higher if not for a community-based flood early warning system (CBFEWS) within the Palmiet Catchment. The Quarry Road West informal settlement is located on a narrow flood plain in the lower reaches of the Palmiet River. During the night on 11 April, flood waters destroyed 350 informal houses (see image on p. 16).



Communicating real-time information across the CBFEWS network on 11 April 2022. Source: Dhesigen Naidoo, written communication, 8 August 2022.

The CBFEWS was developed from the bottom up, through the co-production of knowledge in a local governance platform (state, university, civil society organizations, local activists, and Quarry Road West community members), provided residents of the informal settlement with real-time, accessible and context-specific information which enabled safe evacuation.

The eThekweni Municipality uses a flood forecast early warning system (Delft-FEWS) to produce early warnings and identify hotspots. The system integrates weather information from global forecasts and South African Weather Service warnings, rain and river observations, and radar data to produce localized, real-time data on storms, rainfall, and river levels. The key was ensuring that this information quickly reach vulnerable informal settlers at the base of this short, steep catchment.

This was the role of the CBFEWS—a partnership between regional and city

governments, the University of KwaZulu-Natal, civil society organizations and community leaders. Residents within the informal settlement co-produced and ground-truthed risk maps of their community and co-developed strategies with UKZN researchers. Using the networks established during this project, flood risk warnings and data from municipal officials were transferred to local community leaders through WhatsApp groups. In turn, community members posted river level information, photographs and videos on the WhatsApp group to provide real-time information on the settlement and the flood risk.

Real-time information from the FEWS was transferred via this network from 10-12 April 2022, with no loss of life. The lessons learned will be used to improve the CBFEWS and to work towards scaling it up across the municipality.

Principle 9

Local non-governmental partners should be carefully chosen based on trust by disadvantaged groups for outreach and disaster response.

These may be community-based non-profits, faith-based organizations, social service agencies or schools. Many vulnerable communities may have little confidence in government institutions and, in some cases, in faith-based organizations (Box 3.8).



*Locals stand surrounded by water that was caused by Hurricane Harvey, Orange, Texas, Sept. 5, 2017.
Source: Pfc. Joseph Cannon, 55th Signal Company*

BOX 3.8: SEXUAL AND GENDER MINORITIES AND HURRICANE HARVEY

Sexual and gender minorities face special challenges in accessing disaster relief services and healthcare.

Sexual and gender minorities (SGMs) are often marginalized during disasters as they are overrepresented in populations more at risk for disasters and are “invisible” within emergency and disaster infrastructure. During Hurricane Harvey, a category 4 hurricane that devastated Texas and Louisiana, USA in 2017, SGMs faced unique hurdles in accessing disaster relief services and healthcare.

For example, temporary emergency shelters can be a site of discrimination and violence for sexual and gender minorities, especially those who are undocumented, Black, Indigenous or People of Color, HIV/AIDS positive, elderly, youth, and/or transgender. There is often a lack of recognition of same-gender couples or LGBTQ+ families, which may be “chosen” as opposed to legal or genetic, in shelters that are run by faith-based organizations. This has led to the separation of partners from each other or their children.

In Houston, Texas, mutual aid was necessary to provide housing for SGMs during Hurricane

Harvey. The Montrose Center, a LGBTQ+ community center, raised over US\$ 1 million to provide direct support to the community for shelter during and after Harvey, in partnership with other organizations. However, inclusive and equitable policies that support LGBTQ+ communities would greatly add to the resilience of SGM communities.

After Hurricane Harvey, many SGMs also had trouble accessing aid from the Federal Emergency Management Agency and religious institutions. Necessities such as hormones, HIV medications, and gender affirming products (e.g., wigs) were not covered by insurance or deemed necessary to replace from disaster relief organizations. Those who were HIV/AIDS positive had disrupted access to care and facilities and were at increased risk for water-related illnesses that might exacerbate their health condition.

Sources: Gorman-Murray et al. (2014), Blanchard (2021), Goldsmith and Bell (2022), Goldsmith et al. (2022) and Tran (2021).

Principle 10

Communication messages and materials for disadvantaged communities should be clear and actionable, and tailored to the target audiences.

Conflicting and vague messaging regarding the risk, evacuation pathways and shelter locations, was criticized

by many New Orleans residents after flooding from Hurricane Katrina in 2005 (Box 3.9). When possible (e.g., disaster planning and prevention phase), messaging should be pre-tested with the target communities for clarity, language or dialect, cultural acceptability, relevance, and persuasiveness.



Stakeholders and government water engineers view their prioritized list of the most important challenges, including floods and droughts, facing the various sub-basins within the Yaque del Norte basin in the northeastern Dominican Republic. Source: ICIWaRM.

BOX 3.9: CLEAR, ACTIONABLE AND TARGETED COMMUNICATIONS WITH SOCIALLY VULNERABLE POPULATIONS

There are many ways that information may not be received and acted on by its target community.

Individuals in the New Orleans, Louisiana, USA region displaced by the 2005 Hurricane Katrina complained about having received conflicting and vague messaging from local authorities regarding evacuation decision-making. Later research on their experiences suggested that greater specificity was needed regarding the nature of the risk, whether evacuation was recommended, and where residents could shelter, to help individuals to make better decisions under life-or-death conditions.

Further, complicated messages can also obscure the key risk and steps necessary to reduce it. Flood-related information can be frightening and overwhelming for some

people, particularly persons with emotional and other mental and physical health challenges, the very young, and the very old. Messages and information pathways also need to be tailored for their target audiences. Transmission and uptake of information may be hampered by language barriers, literacy level or hearing or vision loss of the recipient, competition for attention, can hinder. Pre-testing of materials with the target audience, for clarity, cultural acceptability, relevance, persuasiveness and other factors is highly recommended. Ideally, the groundwork for this should be laid early in the disaster life-cycle.

Source: Campbell et al. (2020).

Principle 11

Planners should minimize barriers to participation in meetings, such as holding meetings at well-known centers in the community and on evenings and weekends.

Potential deterrents to participation should be considered, such as language barriers, limited transportation or

child-care options, or nontraditional work hours (second or third shift workers). Women, in particular, are often underrepresented in such public meetings, which is especially problematic since the mortality rate of women can be twice that of men in the same age range (Box 3.10).

BOX 3.10: MAINSTREAMING DRR INTO DEVELOPMENT IN MYANMAR

*Women are often more vulnerable than men to flood events.
DRR needs to be mainstreamed into broader development efforts.*

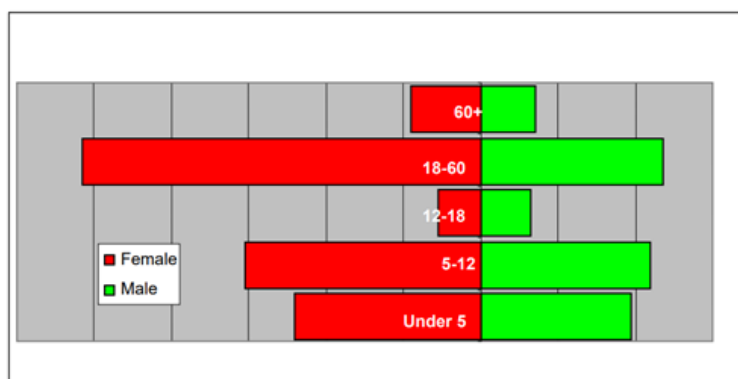
Myanmar is one of the world's most disaster-prone countries, ranking 9th out of 191 countries in the INFORM Index for Risk Management. In 2008, Cyclone Nargis caused about 150,000 deaths and untold property loss and damage. The Post-Nargis Joint Assessment (PONJA)—a collaboration among UN agencies, ASEAN, NGOs, and the Myanmar government—included a Village Tract Assessment (VTA), which identified vulnerabilities and capacities in the worst-hit areas. Among the VTA's conclusions was that the mortality rate of women between the ages of 18 to 60 years was up to twice that of men in the same age range, with follow-on impacts on the children and elderly in their care (see figure below).

Torrential rains from July 2015 and the onset of cyclone Komen triggered severe and widespread flooding and landslides across 12 out of 14 states of Myanmar, severely damaging the transportation network and agricultural production. Half of the most-affected 40 townships were in the two poorest states: Rakhine and Chin.

Another rapid post-disaster national assessment, including inputs from more than 20 government entities, 17 partner organizations, and 17 World Bank Group teams, was conducted to “build back better” and reduce vulnerability and improve living conditions, while promoting more effective and sustainable reconstruction. Between

2015 and 2021, the Myanmar government also mainstreamed DRR into the World Bank's Country Water Sector Reform efforts and the International Flood Initiative Implementation Framework 2016-2022.

The timing was critical for Mainstreaming DRR into its broader development plans.



Indicative Age-Sex Pyramid of the Deaths in 10 Selected Severely Affected Villages.
Source: Tripartite Core Group (2008).

Sources: Prof. Dr. Khin Ni Ni Thein, written communication; Tripartite Core Group (2008).

Advance Knowledge and Education

Principle 12

Planners should avail themselves of GIS-based and probabilistic screening tools that can help identify communities at risk and prioritize investments in urban flood resilience.

Coarse, national-scale tools can be used for initial screening, with finer resolution tools utilized for local decision-making. For example, the World Bank and Indonesian government combined local

socio-economic data, flood hazard maps based on hydro-topographic models and population maps, and poverty data for three cities to identify subdistricts with the highest vulnerability to floods (Box 3.11). In Vermont, USA, probabilistic approaches for minimizing property damage in a watershed were “equity-weighted” to account for the stronger impact that floods would have on the poor (Box 3.12, p.22).

BOX 3.11: FLOODS IN THE NEIGHBORHOOD: MAPPING POVERTY AND FLOOD RISK IN INDONESIAN CITIES

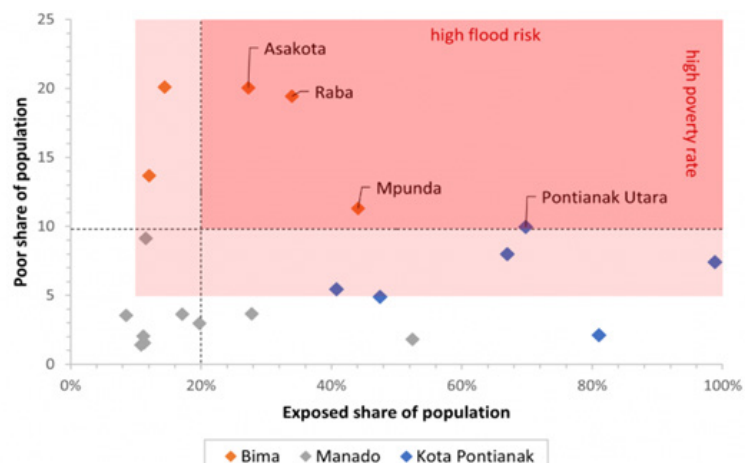
Prioritizing investments is not just about the number of people exposed, but how vulnerable those people are.

In Indonesia, some 76 million people—about 27% of the population—live in high-risk flood zones, and of these, over 40 million live in poverty or extreme poverty.

To gain a more detailed picture of flood risks in Indonesian cities, and with an eye on prioritizing investments, the World Bank and Indonesian government conducted a rapid assessment of human flood exposure in three cities: Bima, Manado, and Pontianak. These are potential pilot cities for a proposed national urban flood resilience program. They combined socio-economic data for city subdistricts and combined these with flood hazard maps based on hydro-topographic models and high-resolution population maps.

In this case, the bank compared the prioritization when considering the highest exposed population to the prioritization when considering a second dimension: the poor share of the population. The figure to the right illustrates that the four highest priority

areas would be different if only considering the exposed share of the population vs. including the poverty information. The analysis offered a rapid assessment of flood risk and poverty levels in all subdistricts of all three cities. The bank identified four subdistricts where very high flood risk (over 20% of population exposed) coincided with poverty rates above the national average. These could be considered targets for urban flood resilience efforts.



Graph of poor vs. exposed population used for prioritizing subdistricts for investment
Source: <https://blogs.worldbank.org/eastasiapacific/floods-neighborhood-mapping-poverty-and-flood-risk-indonesian-cities>.

BOX 3.12: SPATIAL TARGETING OF FLOODPLAIN RESTORATION TO EQUITABLY MITIGATE FLOOD RISK

Equity-weighting can be included in probabilistic approaches for optimizing floodplain restoration, and this can change the locations of interventions.

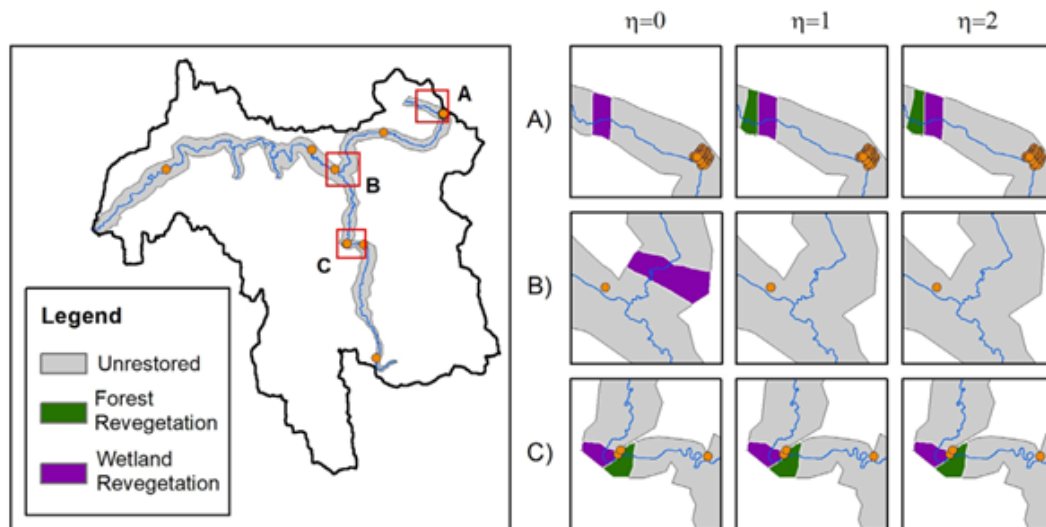
Climate change is expected to increase the number of people exposed to fluvial flood risk and cause greater property damages. Floodplain restoration has the potential to reduce property damages from flood inundation. For example, in the Lewis Creek watershed, Vermont, USA, floodplain restoration has the potential to reduce these impacts by about 20%, and the benefits are estimated to outweigh the costs substantially. However, all restoration measures have costs, and spatial optimization methods can increase cost effectiveness of restoration efforts.

In the case of Lewis Creek, some 5,000 scenarios for floodplain restoration and reforestation were examined probabilistically, integrating a hydraulic flood model and an economic damage cost model, to determine locations of optimal interventions. For all scenarios, a larger proportion of less expensive

properties, especially mobile homes, faced greater flood risk compared to higher-value properties. Therefore, the models were rerun using equity-weighted functions to account for the stronger negative impact that flood damages would have on poorer members of the community. Different weights were chosen, representing the degree of aversion of the community to inequity.

The modeling results showed that consideration of the spatial distribution of benefits and costs and a greater societal desire to protect lower-income residents actually shifted the location of optimal interventions. This demonstrated the importance of considering not only where the flood risk would be most severe, but also the vulnerability of people exposed to such risk.

Source: Gourevitch et al. (2020, 2022).



Optimal floodplain restoration intervention locations and types depend on the weighting ($\eta=0, 1$, or 2) given to protecting the poorer members of the community. Source: Gourevitch et al. (2020)

Principle 13

Government ministries and agencies involved in designing flood preparedness exercises and early warning systems in regions with indigenous communities should incorporate traditional knowledge and practices to the extent possible.

The exercises facilitate acceptance and effectiveness of these systems. For example, in Nepal, flood early warning systems need to incorporate indigenous early-warning indicators such as cloud patterns, vocalizations of animals and birds, wind intensity, and smells (Box 3.13).

BOX 3.13: INTEGRATING INDIGENOUS COPING PRACTICES WITH MODERN FLOOD RISK MANAGEMENT IN NEPAL

Traditional knowledge and practices can be incorporated in FRM through participatory planning to effectively reduce socioeconomic impacts to indigenous communities.

Nepal is prone to hydrological risks such as torrential rains, glacial lake outbursts, regional and flash floods, and landslides, which occur every several years and have claimed several thousands of lives by drowning, landslides and other phenomena. Most of those affected are engaged in agriculture, and these monsoonal floods result in flooding and sediment deposition over large areas, killing poultry and cattle and causing major crop damage, leading to long-term food insecurity.

The Government of Nepal has implemented various FRM measures, including early warning, awareness, emergency tube wells, and post-flood rehabilitation. In addition, NGOs have begun programs to build awareness within the community through different activities. Activities include immediate flood response, training for preparedness and flood response activities, information on flood shelters and emergency relief.

However, traditional and indigenous practices of predicting and coping with floods are as important as the modern approaches. In Nepal, numerous indigenous early-warning indicators for heavy storms exist, such as cloud patterns, extent of rainfall in upper catchments, vocalizations of animals and birds,

wind intensity, and smells related to increased sediment in waters. For flood mitigation, traditional practices include improvement of drainage, raising houses on stilts or raising plinths of houses.

Such traditional knowledge and indigenous practices are beginning to be incorporated into modern FRM practices, to effectively reduce the socioeconomic impacts to traditional communities, through a participatory process that engages them. This has sometimes been overlooked during infrastructure development for industrial, urban and agricultural expansion.

Since 2014, the International Centre for Integrated Mountain Development (ICIMOD) in Nepal has prioritized strengthening resilience to climatic risks and hydrological hazards, with a focus on combining modern research, knowledge, and education with traditional early warning communication from both upstream and downstream communities to reduce loss of life. A systematically operated, community-based early warning system has been successfully piloted.

Source: Dewan (2015).

Principle 14

Government agencies should pay special attention to how early warning and other information flows to and from neighborhoods and individuals.

For example, communication systems must be put in place in advance – before an emergency happens – to make sure

deaf (and blind) people know about emergencies and how to respond (see, for example, <https://www.nad.org/resources/emergency-preparedness/>). In some areas, such as low-income settlements of Lagos, Nigeria, residents did not receive radio and TV warnings due to the lack of electricity (Box 3.14).

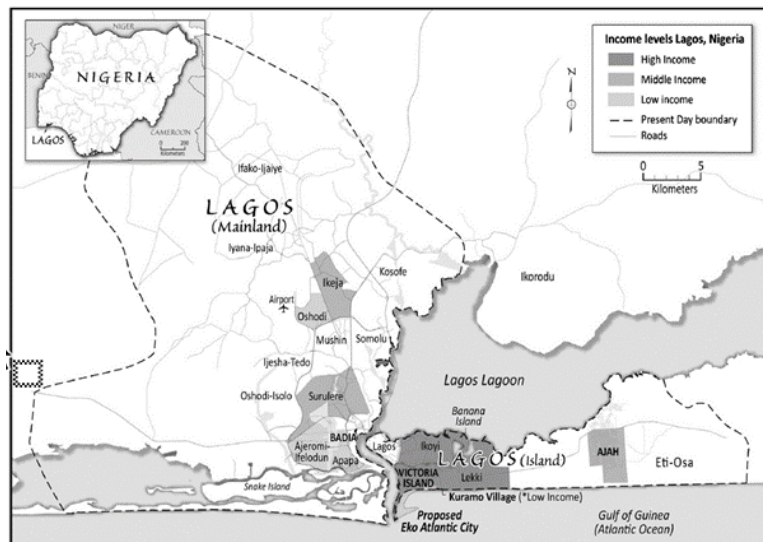
BOX 3.14: POVERTY AND GENDER IN FLOOD VULNERABILITY, LAGOS, NIGERIA

Decreasing flood risk to low-income settlements involves improving communications and trust and strengthening housing rights.

Low-income communities in the coastal megacity of Lagos, Nigeria, are highly vulnerable to flash flooding and to the potential impacts of climate change (see figure to the right). Seventy percent of Lagos residents live in low-income settlements, which often experience floodwaters containing raw sewage and refuse.

However, flood risk in these communities is not just a function of income. Limited access to housing and weak housing rights exacerbates these risks, pushing the urban poor to encroach on hazardous landscapes. According to a study following the July 2011 flood event, forcible evictions and housing demolition, poor environmental conditions, use of solid waste as fill, inadequate housing, and the lack of protective infrastructure were all factors in increasing vulnerability to flooding. Risk was further impacted by the intersection of gender, housing quality, and income. Low-income women in informal settlements recorded higher flood impacts and slower recovery compared to other social categories of both women and men.

Impacts from the flood event were compounded by a lack of response to early



Map of Lagos showing income levels. Source: Jola Ajibade.

warning from official sources. According to the study, a majority of residents did not receive radio and TV warnings due to the lack of electricity. Many who received the warnings did not act because of their lack of trust in the government. Still others stayed in place due to the lack of alternative shelters or transportation. This underscores that flood early warning systems are necessary but not sufficient to save lives and property.

Thus, decreasing flood risk would involve a combination of strengthening housing rights, building trust between government agencies and low-income communities, improving the power grid, broadening the early warning communications methods, and developing social programs targeted at low-income women.

Sources: Ajibade et al. (2013) and Ajibade and McBean (2014).

Principle 15

National agencies, international banks, universities and research institutes, UN agencies, NGOs, and others should coordinate on a shared research agenda to fill in knowledge and methodology gaps.

Fertile areas for research include, but are not limited to:

- Quantifying flood impacts on vulnerable communities, including social, cultural, educational and economic losses so the avoidance of these costs can be counted in the cost-benefit assessments of disaster risk reduction measures,
- Understanding flood-related information flows—to, from and within vulnerable communities,

- Designing, monitoring, and evaluating the effectiveness of community-based flood early warning systems,
- Incorporating traditional knowledge into modern flood forecasting and early warning systems, and
- Improving GIS-based screening tools that can identify communities at risk and help guide interventions.

An annual or bi-annual conference focused specifically on environmental justice in flood risk management would support coordinated research and uptake of methods by practitioners (see, for example, <https://understandrisk.org/about/>).



Rescue workers aid Manila residents after flooding destroyed homes and displaced thousands of people. Two boats assisted more than 52 people, including a woman in labor, elderly residents and children. Source: U.S. Navy

Chapter 4:

Moving Forward

While each country and its national, regional and local institutions must decide for themselves how the “best practices” outlined here can work in their unique political, social and economic frameworks, we can all do better in applying these concepts to our own challenges. There is still much to accomplish. All lives and livelihoods are worth our consideration and that is, in fact, the essence of incorporating environmental justice into flood risk management.

The best practices and the illustrative case studies described in the previous chapter cover all phases of the flood risk management (FRM) life-cycle, including flood mitigation, preparedness, response, and recovery. They target many kinds of actors in government and civil society, including policy- and law makers, senior leaders of agencies, planners and managers, community leaders and others. And, especially, they represent countries in various stages of economic development and with varying social, political, historical, geographic and cultural settings. Nonetheless, several common threads pass through many of the recommendations:

- Policy and law matter. For example, many of the best practices cannot be implemented if land-use and planning regulations lead to poorer communities being located in more vulnerable locations to flooding.
- Leadership matters, and little may be accomplished at the working level if senior agency leaders are not on board.

- Relationships matter, and strong ties between government agencies at all levels, local organizations, and the people affected by their decisions are essential.
- Communication matters, as the right message delivered via the wrong medium, or vice versa, will not be heard or heeded.
- Awareness matters, as a single-minded pursuit of engineering or political goals without an understanding of the human element may lead to failure.

FRM and environmental justice are merely components of the broader framework of integrated water resources and land-use planning; they cannot be considered in isolation. As Hallegatte et al. (2017) state:

“Understanding the disproportionate vulnerability of poor people [to floods and other disasters] also makes the case for setting new intervention priorities to lessen the impact of natural disasters on the world’s poor,

such as expanding financial inclusion, disaster risk and health insurance, social protection and adaptive safety nets, contingent finance and reserve funds, and universal access to early warning systems. Efforts to reduce disaster risk and poverty go hand in hand. Because disasters impoverish so many, disaster risk management is inseparable from poverty reduction policy, and vice versa.”

As noted in Box 3.14 (p.24) in Chapter 3, some of the best ways to strengthen flood resilience among disadvantaged communities involve integrating FRM with broader community development and revitalization efforts. These may include upgrading the power grid, improving the educational system, modernizing the communications network, strengthening building and construction standards, improving the transportation network, and increasing housing opportunities. Conversely, bolstering flood resilience in these

communities will likely contribute to long-term economic growth and opportunities. Thus, the relationships built during, and lessons learned from, our efforts to incorporate environmental justice into FRM can be leveraged beyond water resources management and disaster planning towards a better integration of vulnerable communities into our social and economic systems.

Overall, we are making progress. As shown in Chapter 2 and several case studies, many of the largest institutions that fund FRM infrastructure, or plan and manage elements of the FRM life-cycle, are incorporating concepts of equity and environmental justice into their design, consultation and approval processes. Stakeholder engagement and incorporation of local knowledge at early phases of development is now expected. And we are developing tools and indicators to identify underserved areas and measure our progress towards serving them.



Source: Joselyn Augustino, FEMA

Acknowledgements

This report was conceived of, and prepared with, the input and collaboration of numerous international experts, inside and outside of the HELP Advisors group. These included Niels Vlaanderen, Koos Wierik, Joe Manous, Tom Panella, Gretchen Kalonji, Jerome Delli Priscoli, Khin-Ni-Ni Thein, Toshio Koike, Gordon McBean, Harm Duel, Tony Slatyer, Judith ter Maat and Susan Durden. Likewise, we are grateful to the HELP Chair Han Seung-soo, the HELP Coordinator Kenzo Hiroki and other staff of the secretariat for helping to shape the report over numerous meetings.

Some of the report sections and case studies were directly drafted by those who are cited below the sections. Others were drafted by the report authors using the cited publications (and personal communication). We are grateful to all of those who contributed their ideas to these sections and studies, directly or indirectly.

An important source of ideas and case studies was a USACE webinar series, “Bridging the Equity Gap” (<https://www.iwr.usace.army.mil/Missions/Flood-Risk-Management/Flood-Risk-Management-Program/News-and-Events/Bridging-the-Equity-Gap/>). We thank all the organizers and speakers who participated in this groundbreaking series.

We would also like to thank our reviewers. These included Tony Slatyer, Ruben Dahm, Theresa Hudson and Joe Manous. Although the reviewers listed have provided many constructive comments and suggestions, they were not asked to endorse the findings and bear no responsibility for any remaining errors of omission or commission. The views, opinions and conclusions expressed in this report are those of the authors and do not necessarily reflect the views of HELP or any other organization or government the authors represent.

We would like to thank the U.S. Army Corps of Engineers and its Institute for Water Resources for suggesting the HELP flagship initiative that led to this report and for the financial support of W. Logan and C. Cooper. We also acknowledge DELTARES for its assistance in organizing an informal working group and for the financial support of K. Roscoe.

Finally, we would like to express our thanks to Chloe Cooper, who capably assisted with formatting and editorial work under great time pressure.

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